



Munich Personal RePEc Archive

# **Export Diversification Dynamics in Latin America**

Chanci, David

Universidad Santo Tomás

30 December 2012

Online at <https://mpra.ub.uni-muenchen.de/44241/>

MPRA Paper No. 44241, posted 06 Feb 2013 19:34 UTC

# Export Diversification Dynamics in Latin America.

Manuel R. Agosin T.<sup>1</sup>  
Universidad de Chile

David Chancí A.<sup>2</sup>  
Universidad Santo Tomás

2012, (*first draft, comments are welcome*)

## Abstract

The abundance of natural resources in Latin American countries has led to a challenge for governments when designing their public policies for economic growth. Moreover, in recent years the increase in the price of commodities has stimulated a rise in the terms of trade and a tendency towards export concentration. Conversely, today there is more agreement about the role of export diversification in order to enhance economic growth in developing economies. This paper presents a detailed description of the exporter behavior for seventeen countries in Latin America between 1990 and 2011 focusing on export diversification in terms of commodities and markets. Also we explore the diversification by dividing the export growth rate into the contribution of existing, new and disappearing exports. We found that exports in Latin American have diversified across countries with Mexico, Brazil and Argentina being the most diverse. However in all the Latin American countries the export growth rate is strongly supported by existing exports more than new exports.

Keywords: *International trade dynamics, Export Diversification, Intensive and Extensive margins.*

JEL Codes: *F14.*

---

<sup>1</sup> Email: [managosin@econ.uchile.cl](mailto:managosin@econ.uchile.cl)

<sup>2</sup> Email: [luischanci@santotomas.cl](mailto:luischanci@santotomas.cl)

## I. INTRODUCTION

Since the Prebisch-Singer Thesis in the 50s there has been an agreement about the negative effects of export concentration in primary products and the decline in the terms of trade. Recently, some authors (Agosin, 2009; Hesse, 2008; Lederman and Maloney, 2007) have related export diversification with economic growth for developing economies. The greater the degree of exports concentration, the more vulnerable to external shocks are exports. It implies greater volatility for the income from exports and less economic growth. This argument has also been used to counter the so-called “*Natural Resources Curse*”<sup>3</sup>, which has become a policy concern.

In this case the main link for the relationship between diversification and economic growth is the capacity of adjustment in terms-of-trade shocks. This is called *the portfolio effect*, which takes its name from the financial theory. Additionally, the literature has also featured the advantages that embody the new exports over the productivity, called *dynamic benefits* (Agosin, 2009). Thus, for technologically backward economies the copy of production of new goods, that already exist elsewhere, represents a local innovation that promotes economic growth by expanding the comparative advantages. Also, introducing new goods to the export basket has some externalities. For example, these externalities could be the technological transferences between sectors, the underlying cost structure that is revealed to other producers and the identification of new demand sources (Agosin y Bravo-Ortega, 2007).

Although there has been a growth in literature around the relevance of new exporting activities in international trade for developing countries, there has been little attention paid to thoroughly describing and understanding the export performance in Latin American countries. However, in the case of Chile, Berthelon (2011) presents a deep description of the exports performance, separating copper and non-copper exports.

Above all, the understanding of the performances of export diversification up to now has become more relevant in recent years, where there has been a noticeable increase in the terms of trade especially due to the prices of the commodities.

In this paper we integrate a set of diversification measures in order to make a detailed description of the exports diversification dynamics in Latin America. We use the last available information contained in the Comtrade database from the United Nations, covering the period between 1990 and 2010. Specifically, we analyzed export performance in terms of the intensive and extensive margins in two ways. First, we computed export concentration/diversification indexes for each country and year over the twenty year period. In addition, following Cadot et al. (2011), we used the Theil index which can be broken down into two components, the *between* and *within*. These give an idea of the isolated effect of the number of active export lines (*Extensive Margin of Diversification*)

---

<sup>3</sup> Term associated to the negative statistical relation between natural resources abundance and economic growth, found by Sachs and Warner (1995).

and the exports volume distribution (*Intensive Margin of Diversification*) over concentration/diversification. Furthermore, we identify the total number of markets and the exports fraction sent to the ten main destinations. Second, following Brenton and Newfarmer (2007), Amiti and Freud (2010) Besedes and Prusa (2011), and Berthelon (2011), we made an analysis of the export diversification by separating the export growth rate into two different margins. The first consists of those exports in advanced phases of the exportation cycle, like acceleration or maturation (*Intensive Margin of Export Growth*). The second margin is the *discovery channel*, or the new relationships that are established (*Extensive Margin of Export Growth*).

Based on 17 selected countries, between 1990 and 2011, Latin American exports have grown on average 12% annually. Also diversification has increased over the last two decades with Brazil, Argentina and Mexico being the most diversified countries in the region. However, taking the most recent years into consideration, there has been decreased diversification in the region.

In terms of goods, using the Theil index, exports concentration is strongly characterized by volume distribution or *intensive margin*, especially for countries like Venezuela, Ecuador, Chile, Bolivia and Paraguay. Furthermore, diversification in the number of markets has increased, passing from 117 in 1990 to 163 in 2010. Also, the number of active groups or active lines at three digits of aggregation has increased from 204 in 1990 to 236 in 2010.

The paper is structured as follows: Section two presents the literature review about diversification and extensive/intensive margins. Section three describes the data and presents the results. Finally, section four presents some conclusions.

## II. RELATED LITERATURE

According to traditional trade theory, countries should specialize and exploit comparative advantages. Imbs and Wacziarg (2003), found a '*U-shaped*' relationship between industrial concentration and income levels. Whereby countries with low- and middle-income tend to diversify production and specialize at higher income levels. Klinger and Lederman (2006), using panel data for 73 countries, covered the period 1992-2003, investigate this relation for export diversification and income levels, found that countries are benefitted by diversification in early stages and then by specialization.

Cadot et al. (2009) extended this idea and --using panel data-- estimated a non-linear model. The authors found a turning point around 25,000 dollars per capita. Moreover, using a breakdown of Theil's concentration index, which maps directly into the extensive and intensive margins of export diversification, they found that diversification mostly goes along the extensive margin.

In a theoretic model Hausmann and Rodrik (2003) establish that in the first stages of development, diversification can help the producers identify sectors where they could have comparative advantages. However, developing economies tend to under-invest in discovery process, since the introduction of a new good, or the application, of a new technology is easily copied, because such technological innovations cannot be patented in the economy where they are introduced. Therefore, the leader will not reap all the benefits of his investment. Under this perspective the government should play an active role by promoting entrepreneurship and creating the right incentives for entrepreneurs to invest in a new range of activities.

In this way, attention has been directed towards diversification like one element to promote growth in developing economies. Specifically, on an empirical level Agosin (2009), Lederman and Maloney (2007), Iglesias (2005), Hesse (2008), have related diversification with the economic growth rate, measuring diversification with the Hirschman-Herfindahl concentration index (HH).

Lederman y Maloney (2003) explored the empirical relationship between trade structure and economic growth, especially natural resource abundance, export concentration and intra- industry trade. Using a dynamic cross-country panel model they found evidence that export concentration hampers growth obtaining a negative marginal effect of the HH index in the estimated empirical model.

Also, Hesse (2008) studies the negative effect of concentration on economic growth and explores a non-linear relationship between diversification and growth. Estimating a robust model using GMM System he found evidence that diversification promotes economic growth.

Agosin (2009) presents a model of growth that emphasizes the introduction of new exports as the main source of growth in countries that are below the technology frontier and depend on growth for adapting existing products to their economic environment. Thus diversification allows a widening in comparative advantage and has associated some externalities that promote growth. Also he finds that export diversification has a stronger effect on growth when exports grow faster than alone.

Trying to study some characteristics of the export cycle that enhance trade, Brenton and Newfarmer (2007), Amurgo-Pacheco and Pierola (2008), Besedes and Prusa (2007), made a decomposition of the export growth rates in margins. They found that economies with better export performance are characterized by exporting larger quantities of existing products or equivalently growing in the intensive margin of export growth.

Brenton and Newfarmer (2007) examined whether the discovery channel is important to guide trade policies in this way, considering the scarce resources of governments. Decomposing the export growth rate for the period 1995-2004 they found that the intensive margin on average represents more than eighty percent of the total export growth rate.

Also they found that this percentage could be higher if it was not affected by the trade relationships that disappear, especially in economies with a poor export performance.

Amurgo-Pacheco and Pierola (2008) working with a panel data for 24 countries during the period of 1990-2005 found that extensive margin represents 14 percent of the export growth rate and it is given mainly by geographical diversification.

In a more detailed study, Berthelon (2011) made a characterization of the Chilean exports performance from 1990 to 2007. Chilean exports have had a significant growth, especially over the period from 2003 to 2007 with an average rate of 34%, due to exports facing a positive shock in the copper price. Also in this period, the copper exports became to represent a 64% of total exports. However, separating the analysis of total exports without including copper, the author found that diversification has increased both in terms of markets as in goods.

### **III. MEASURING DIVERSIFICATION**

In order to explore export diversification in the Latin American countries we are going to use a set of tools to measure it in terms of both goods and markets.

While our goal is diversification, the quantitative indices come from the income-distribution literature and measure concentration. These are the Theil, Gini and the Hirschman-Herfindahl indexes (see appendix). Furthermore, the Theil index has decomposability properties that are exploited by Cadot et al. (2011). These properties will be discussed in more detail in the next section.

Although the above indices are the most widely used, there is an alternative way to explore diversification. In order to explore the expansion of the export basket due to the discovery channel, Brenton and Newfarmer (2007) broke up the export growth rate into different margins as will be shown later.

#### **Margins of Export Diversification**

In terms of goods, export diversification is affected not only by the distribution of the value across the existing exports lines (*Intensive Margin of Diversification*) but also by adding more export lines (*Extensive Margin of Diversification*). Specifically, concentration at the intensive margin measures the inequality between the shares of active export lines. Conversely, diversification at the extensive margin can be interpreted as a rising number of active lines. This is important as the dynamics in each margin '*reflect a very different*

evolution of a country's productive activities and policies aiming to enhance diversification in either margin to entail distinct recommendations' (Cadot et al 2011).

Separating a data set in a number (represented by  $G$ ) of groups (each one identified with  $g$ ), the Theil's index has the property that it can be calculated through addition into *within-groups* and *between-groups* components.

$$T = T^B + T^W \quad (1)$$

$$T^B = \sum_{g=1}^G \frac{n_g}{n} \ln\left(\frac{\mu_g}{\mu}\right) \quad (2)$$

$$T^W = \sum_{g=1}^G \frac{n_g}{n} \left(\frac{\mu_g}{\mu}\right) \left[ \frac{1}{n_g} \sum_{k \in g} \frac{x_k}{\mu_g} \ln\left(\frac{x_k}{\mu_g}\right) \right] \quad (3)$$

Where,  $x_k$  represents the value of the observation  $k$  that belongs to the subgroup  $g$ , and  $\mu_g$  is the average of the value in group  $g$ .

As Cadot et al (2011) showed, changes in the *between-groups* component measures changes at the *extensive margin* whereas changes in the *within-groups* part measures changes at the *intensive margin*. Specifically, by taking the maximum number of exports lines  $n$  that can be active by an exporter and dividing them into two groups, where  $G_1$  will correspond to those lines which are active and  $G_0$  to the inactive (or those lines for which there are not exports values), the Theil's index components results in the next two equations.

$$\lim_{\mu_0 \rightarrow 0} T^B = \ln\left(\frac{n}{n_1}\right) \quad (4)$$

$$\lim_{x_0 \rightarrow 0} T^W = \frac{n_1}{n} \left(\frac{\mu_1}{\mu}\right) \left[ \frac{1}{n_1} \sum_{k \in G_1} \frac{x_k}{\mu_1} \ln\left(\frac{x_k}{\mu_1}\right) \right] \quad (5)$$

Then, the *Between* component maps the fact of a country being concentrated in a few sectors or similarly, diversification at the extensive margin means a rising number of active export lines. Conversely, The *Within* component maps the distributive effect.

## Intensive and Extensive Margin of the Export Growth Rate

There is a different way to study the performance of the export diversification, which implies both, goods and markets. The new goods and markets that are incorporated to the basket increase the export growth rate (extensive margin of the export growth rate). Specifically, in this section we present a break down of the export growth rate looking for activity at different margins.

Following Brenton and Newfarmer (2007), Amiti and Freund (2010), Besedes and Prusa (2011), the total growth in trade relative to a base period can be divided into three parts. The first one is the persistent relationships or those that survive (*s*). This part represents an increase of existing products to current markets. The second part considers the relationships that end, being the set of products/markets that disappeared (*d*) between periods. Finally, the third part considers the new (*n*) relationships. This part is the increase in export growth due to the incorporation of new or existing products to new or existing geographical markets. Hence, the export growth rate between periods (*t*) and (*t* – 1),  $\gamma_{exp} = \Delta E_t / E_{t-1}$ , can be described by the following equation (6).

$$\Delta E_t = \underbrace{\sum (E_t^{(s)} - E_{t-1}^{(s)})}_{\text{Survivor (s)}} - \underbrace{\sum E_{t-1}^{(d)}}_{\text{Disappear (d)}} + \underbrace{\sum E_t^{(n)}}_{\text{New (n)}} \quad (6)$$

Being the *Intensive Margin* of export growth the difference between the first two components (Survivors minus disappeared) divided by exports in the previous period, and the *Extensive Margin* is formed by the last part (*New*) in equation 6.



## IV. DATA AND RESULTS

Our data comes from the United Nations Commodity Trade Statistics Database. We used export data for seventeen countries over the period between 1990 and 2011, recorded using the Standard Industrial Trade Classification revision 3 at the 3-digit level of disaggregation. Although in general the frequency of the data is annual, in order to incorporate the midterm analysis, we also are going to work with periods of five years in the analysis of the margins of the export growth rate.

### General Overview of Latin American Trade

Figure 1 shows the total exports of the seventeen selected Latin American countries. The main exporters in the region are Mexico, Brazil, Venezuela and Chile. In nominal terms, Brazil was the first exporter in 1991 sending \$31 billion closely followed by Mexico with \$27 billion. However, quickly, Mexican figures from 1991 onwards show that Mexico became the primary exporter in Latin America. In 2011, Mexican exports totaled \$349 billion while Brazil occupied second place with \$259 billion. Therefore, these two countries cover more than half of total Latin American exports.

Looking at the descriptive statistics in table 2, on average total exports in Latin America have grown at 8.2% annually, being characterized by a high volatility. As we can see in figure 2, the late 90's was a period of decline in exports until the end of the Asian crisis. After that, the exports started to have a significant recovery. Finally, the period was closed by the impact of the world financial crisis, which produced a contraction of over 17% in 2009.

Figure 3 shows the growth rate for each country, highlighting the differences in the export performances within countries. The first one is the volatility. Many Central American countries, for example Nicaragua, present a high volatility while others, like Mexico and Brazil, tend to have a slower growth rate but with more continuous positive periods. Second, we can see that there was a period, after the Asian crisis but before the financial crisis, in which countries like Bolivia, Chile, Ecuador, and Venezuela achieved a growth rate above 30%. One important feature behind this last remarkable growth was the high prices of commodities (figure 4), which also led to a favorable increase in the terms of trade in the region (see figure 5) and as will be shown later this can also be related with the current increase in export concentration. In general, there are big differences in export performances between Latin American countries, which are determined by characteristics of the export structure, like markets and products.

## Diversification in terms of good

The first proxy used for export diversification is the Herfindahl-Hirschmann Index (HHI). However imperfectly, this indicator captures both vertical and horizontal diversification. By vertical diversification is meant the shift from exporting, say, primary commodities to exporting manufactures. Horizontal diversification means broadening the export basket by diversifying into goods within the same broad category; for example, from grapes with seeds to seedless grapes, or from coffee for the mass market to gourmet coffee (Agosin, 2009).

Figure 6 shows the average value of the diversification index for the region according to the selected countries. In the early 90's, Latin America followed a strong path towards export diversification, however since the turn of the millennium it has slowly but steadily declined. Furthermore, figure 7 reveals the high heterogeneity in terms of concentration that exists between countries. Thus, Argentina, Brazil and Mexico are the most diversified countries with values of HHI under 0.04 (or diversification index of over 0.96), which is similar to the reported results for some emerging Asian economies (Agosin, 2009). Conversely, Venezuela is the most concentrated country with a value of *HHI* of over 0.98 in 2006, while other countries like Bolivia, Chile, Colombia, Ecuador and Paraguay have tended towards exports concentration in the last decade. The conclusion also remains the same if we use alternative measures such as the adjusted HH or Theil indices (table 3).

Now, we are going to study diversification in terms of the number of goods exported. By reviewing the number of active lines, or in other words, the SITC codes in which there are values of exports different to zero. Specifically, as data is disaggregated at the three-digit level, the SITC code corresponds to groups of goods. To illustrate, table 4 presents the statistics of the number of active lines. As we can see, the maximum number of positions in the SITC is 259, which corresponds to Mexico. In addition, figure 8 shows the number of active lines over time. Argentina, Brazil, and Mexico are the countries that cover the highest number of active lines. But in general, all the Latin American countries have tended to increase the number of lines.

Finally, from the potential 260 active lines that a country could had in any year, we are going to take the main ten active lines (for each country) and explore how much weight these lines have over the total exports. Figures 9 and 10 show the results for each country from 1990 to 2011. The first common characteristic for all countries is that the main ten active lines account for more that the sixty percent of the total exports. Only in the Mexican and Brazilian cases do these ten lines weigh less than 40 percent, meaning that the other lines have more representation and in this way, more diversification. Moreover, if we look at the Bolivian exports of natural gas (SITC code 343) it grew from 8% in 2000 to more than 40% in 2011. For Chile, the exports of copper and copper-concentrates (SITC 682 and 283) have represented almost half of the total exports. Also for Colombia and Ecuador the exports of Petroleum oils and Petroleum products (SITC 333 and 334) have represented more than 55% of total exports and in an extreme case, Venezuela exports

only these two types of commodities, representing a share of over 90% of total exports. Above all, we can highlight the fact that the key groups of exports in some Latin American countries are raw materials.

### **Margins of the export diversification: Theil Index**

Figure 11 shows the different margins of the export diversification by using the Theil Index. As we can see, the low diversification degree is mainly explained by the intensive margin, or in other words, the main export concentration is explained by the low distribution of the total value of exports over all the active lines. The extensive margin is less relative to the export concentration in Latin America. According to these results, increasing the number of active lines of the export is not necessarily the main concern. Nevertheless, we can appreciate differences between countries in both margins. At the intensive margin the conclusions made with the HHI remain, but at the extensive margin we can see that Bolivia, Panama and Paraguay still have potential to increase the numbers of exports groups.

In part the result of the Theil index for the extensive margin is almost reasonable considering the results showed previously. Although this result can suggest that the level of disaggregation in the data plays a crucial role. For example, the maximum numbers of active lines is around 266 and, as we have seen, many Latin American countries are near this number. Maybe more disaggregated data would have much more to say about the importance of adding new lines of exports. To illustrate, by using the Harmonized System at a 6-digit level the maximum number of categories is around 5200. If from these lines we use only 4500 as the “technological frontier,” (which corresponds to a big exporter like United States or Germany), we can figure out that there is a big difference in the number of active lines in the Latin American countries where, for example, a country like Chile exports around 3300 categories.

### **Diversification in markets**

Perhaps diversification in terms of goods has been the main topic discussed by the academic literature, but no less important is the role that the diversification in terms of markets has. In other words, equally important is the number of potential destinations for the exports. Even when having sold a large quantity of goods, if these are only sold to a small group of countries, the income from exports will be exposed to the same economic volatility as the country of destination.

Table 5 shows the descriptive statistics for the number of markets. On average, the region exports to 129 destinations, with Brazil being the country that has presented the maximum number of trade relationships by exporting to approximately 200 markets. Conversely,

Bolivia, El Salvador, Nicaragua, Panama and Paraguay, are the least diversified countries in terms of markets, by having less than 100 countries as export destinations. Moreover, if we study the evolution over time, in figure 12 we can appreciate that there has been a systematic increase in the number of markets for all countries. This means that diversification in terms of markets has been enhanced.

Figures 13 and 14 show the share of trade for the ten most important markets. The first characteristic is that for all Latin American countries, more than 60% of their total exports are concentrated in less than 10 countries. Also, this share is over 80% for many countries, the extreme case being Mexico, which sends around 90% of its exports solely to the United States. For Brazil, the main destinations are China, the United States and Argentina, with around 15%, 10% and 8%, respectively, whereas for Chile, China is the main destination, accounting for over 25% of its total exports. Furthermore, Argentina, Paraguay, Uruguay and specifically Bolivia, are the only countries for which another Latin American country (Brazil) plays a significant role as a destination.

Despite the fact that the number of markets has increased for all countries, there remains inequality in the distribution of the value of exports between the existing markets, which signifies that there is still export concentration in terms of markets.

### **Margins of the export growth rate.**

Table 6 presents the descriptive statistics for the different margins of the export growth rate during the four sub-periods. On average, the export growth rate is 47.2%, being the result of an increase in the persisting (exports of the same goods to the same markets) in 46.7%, the addition of new relationships (new markets and/or goods) of 0.7% and a fall of over 0.2% due to the relationships that disappears (left side on the table). In this way, the intensive margin accounts for more than 98% of the total export growth rate, while the extensive margin for 1.5% (right side of table). In general these results are similar for all countries.

Figure 15 presents the different margins of the export growth rate. We can see that the main margin is the intensive. In this way, in the period with a negative exports growth rate, it has been related with the intensive margin, that is, there has been a fall of the traditional exports and the result is not related with the disappearing share. Moreover, Chile is the only country that shows a representative share of disappearing exports, and it was in the period 2006-2010. Finally, only Argentina and Bolivia have shown a significant part at the extensive margin, but it was in the first period 1996-2000.

## **V. CONCLUSION**

In this article we studied in depth the export diversification for some selected countries in Latin America, in particular, diversification in terms of goods and markets.

In general, diversification has gone down in recent years, especially in a period when the prices of commodities have gone up.

In terms of goods, diversification in Latin American countries seems to be more important in terms of distribution and less in terms of the number of active lines, that is to say, the intensive margin.

In terms of markets, the number of destinations has increased over time, yet only a small number of markets account for a large share of trade, implying that there is also export concentration in term of markets, mainly due to characteristics of the distribution.

## REFERENCES

- Agosin, M., "Trade and Growth: Why Asia Grows Faster Than Latin America," in *Growth with Equity in Latin America*, R. Ffrench-Davis and J.L. Machinea (eds.), Basingstoke, Palgrave-Macmillan (2007).
- "Export Diversification and Growth in Emerging Economies," *Cepal Review* 97 (2009), 115-131.
- Agosin, M., and Bravo-Ortega C., "The Emergence of New Successful Export Activities in Latin America: The Case of Chile." Inter-American Development Bank research working Paper, no. R-552 (2009).
- Amiti, M., and Freud, C., "The Anatomy of China's Export Growth," in *China's Growing Role in World Trade*, Feenstra, R., and Shang-Jin W., (eds.), NBER Volume, University of Chicago Press, ISBN: 0-226-23971-3 (2010).
- Amurgo-Pacheco, A., and Pierola M., "Patterns of Export Diversification in Developing Countries: Intensive and Extensive Margins." World Bank policy research working paper, no. 4473 (2008).
- Berthelon, M., "Desempeño del Sector Exportador Chileno: El Rol de los Márgenes Intensivo y Extensivo," *Economía Chilena* 14(2011).
- Besedes, T., "Export Differentiation in Transition Economies," *Economic Systems* 35 (2011) 25-44.
- Besedes, T., and T. Prusa, "The role of Extensive and Intensive Margins and Export Growth," *Journal of Development Economics* 96 (2011), 371-379.
- Brenton, P., and R. Newfarmer, "Watching More Than the Discovery Channel: Export Cycles and Diversification in Development," World Bank policy research working paper, no. 4302 (2007).
- Cadot, O., Carrère, C., and Strauss-Kahn V., "Export Diversification: What's Behind the Hump?," *The Review of Economics and Statistics* 93(2011), 590-605.
- Hausmann, R., B. Klinger, "Structural Transformation and Patterns of Comparative Advantage in the Product Space," mimeograph, Harvard University (2006).
- Hausmann, R., and D. Rodrik, "Economic Development as Self-Discovery," *Journal of Development Economics* 72 (2003), 603-633.

Hesse, H., "Export Diversification and Economic Growth" Commission on Growth and Development working paper no. 21 (2008).

Hummels, D., and P. Klenow, "The Variety and Quality of a Nation's Exports," *American Economic Review* 95 (2005), 704–723.

Imbs, J., and R. Wacziarg, "Stages of Diversification," *American Economic Review* 1993 (2003), 63–86.

Kehoe, T. J., and K. J. Ruhl, "How Important Is the New Goods Margin in International Trade?" Society for Economic Dynamics meeting papers no. 733 (2006).

Klinger, B., and D. Lederman, "Discovery and Development: An Empirical Exploration of 'New' Products," mimeograph (2004).

Lederman, D., and W. Maloney, "Trade Structure and Growth," World Bank working paper series no.3025 (2003).

Prebisch, R., *The Economic Development of Latin America and Its Principal Problems* (Lake Success, NY: United Nations Department of Economic Affairs, 1950). Reprinted in *Economic Bulletin for Latin America* 7 (1962), 11–22.

Sachs, J., and Warner A., "Natural Resources Abundance and Economic Growth," NBER working paper no.5398 (1995).

----- "The Big Rush, Natural Resource Booms and Growth," *Journal of Development Economics* 59 (1999), 43–76.

Singer, H., "US Foreign Investment in Underdeveloped Areas: The Distribution of Gains Between Investing and Borrowing Countries," *American Economic Review* 40 (1950), 473–485.

## Appendixes

Table 1 List of Countries and years (information available)

<b><i>Comtrade Database</i></b>			
<b><i>SITC Rev 3</i></b>			
<b>Country</b>		<b>Period</b>	
<b>1</b>	Argentina	1992	2010
<b>2</b>	Bolivia	1992	2011
<b>3</b>	Brazil	1989	2011
<b>4</b>	Chile	1990	2011
<b>5</b>	Colombia	1991	2011
<b>6</b>	Costa Rica	1994	2011
<b>7</b>	Ecuador	1990	2011
<b>8</b>	El Salvador	1994	2010
<b>9</b>	Guatemala	1993	2011
<b>10</b>	Honduras	1993	2007
<b>11</b>	Mexico	1989	2010
<b>12</b>	Nicaragua	1993	2010
<b>13</b>	Panama	1995	2011
<b>14</b>	Paraguay	1989	2011
<b>15</b>	Peru	1992	2011
<b>16</b>	Uruguay	1993	2009
<b>17</b>	Venezuela	1990	2011



Table 2. Statistics of the Export Growth Rate.

<b><i>Country</i></b>	<b><i>mean</i></b>	<b><i>max</i></b>	<b><i>min</i></b>	<b><i>sd</i></b>
<i>Argentina</i>	8,4%	29,9%	-18,3%	11,7%
<i>Bolivia</i>	12,7%	46,5%	-21,1%	17,8%
<i>Brazil</i>	8,6%	27,4%	-20,6%	11,2%
<i>Chile</i>	10,1%	44,9%	-16,2%	17,1%
<i>Colombia</i>	9,0%	34,8%	-10,3%	12,1%
<i>Costa Rica</i>	7,8%	39,5%	-15,8%	15,4%
<i>Ecuador</i>	9,1%	28,2%	-24,3%	14,1%
<i>El Salvador</i>	3,6%	31,7%	-14,4%	11,2%
<i>Guatemala</i>	3,5%	26,4%	-42,3%	16,7%
<i>Honduras</i>	4,1%	41,0%	-26,4%	19,0%
<i>Mexico</i>	8,8%	28,3%	-19,0%	10,8%
<i>Nicaragua</i>	8,7%	51,6%	-43,6%	25,5%
<i>Panama</i>	5,3%	24,9%	-3,9%	7,7%
<i>Paraguay</i>	8,4%	49,0%	-28,2%	21,6%
<i>Peru</i>	13,1%	36,1%	-15,1%	14,9%
<i>Venezuela</i>	6,8%	54,1%	-30,4%	22,2%
<b><i>Total</i></b>	<b>8,2%</b>	<b>54,1%</b>	<b>-43,6%</b>	<b>16,0%</b>

Table 3 Descriptive Statistics for the Diversification/Concentration Indices

Country	Variable	Mean	Max	Min	SD	Country	Variable	Mean	Max	Min	SD
Argentina	Diversification	0,962	0,968	0,957	0,003	Honduras	Diversification	0,872	0,925	0,681	0,065
	Adjusted HH	0,034	0,040	0,028	0,003		Adjusted HH	0,124	0,316	0,071	0,065
	Total Theil	1,665	1,795	1,542	0,064		Total Theil	2,693	3,735	2,266	0,423
	Theil Within	1,523	1,653	1,387	0,063		Theil Within	2,435	3,416	2,033	0,391
	Theil Between	0,143	0,155	0,135	0,006		Theil Between	0,258	0,352	0,208	0,043
Bolivia	Diversification	0,874	0,939	0,756	0,063	Mexico	Diversification	0,956	0,972	0,868	0,024
	Adjusted HH	0,121	0,239	0,056	0,063		Adjusted HH	0,040	0,128	0,025	0,024
	Total Theil	2,850	3,488	2,375	0,387		Total Theil	1,664	2,242	1,465	0,180
	Theil Within	2,445	2,955	2,028	0,322		Theil Within	1,528	2,099	1,330	0,179
	Theil Between	0,405	0,663	0,238	0,131		Theil Between	0,136	0,155	0,123	0,008
Brazil	Diversification	0,976	0,980	0,951	0,008	Nicaragua	Diversification	0,909	0,950	0,866	0,024
	Adjusted HH	0,020	0,045	0,016	0,008		Adjusted HH	0,086	0,130	0,046	0,024
	Total Theil	1,334	1,739	1,209	0,135		Total Theil	2,598	2,940	2,034	0,224
	Theil Within	1,193	1,608	1,055	0,139		Theil Within	2,276	2,617	1,733	0,212
	Theil Between	0,141	0,167	0,127	0,012		Theil Between	0,322	0,402	0,246	0,049
Chile	Diversification	0,867	0,905	0,806	0,033	Panama	Diversification	0,888	0,963	0,816	0,050
	Adjusted HH	0,130	0,190	0,092	0,033		Adjusted HH	0,107	0,177	0,033	0,049
	Total Theil	2,653	3,056	2,387	0,226		Total Theil	2,589	3,189	1,856	0,455
	Theil Within	2,492	2,901	2,237	0,224		Theil Within	2,045	2,369	1,636	0,228
	Theil Between	0,160	0,187	0,143	0,011		Theil Between	0,544	0,909	0,195	0,279
Colombia	Diversification	0,909	0,939	0,804	0,032	Paraguay	Diversification	0,822	0,868	0,758	0,033
	Adjusted HH	0,087	0,193	0,057	0,032		Adjusted HH	0,173	0,236	0,126	0,033
	Total Theil	2,247	2,988	1,941	0,251		Total Theil	3,188	3,629	2,918	0,179
	Theil Within	2,082	2,849	1,798	0,248		Theil Within	2,630	2,924	2,327	0,169
	Theil Between	0,166	0,204	0,135	0,021		Theil Between	0,558	1,055	0,343	0,189
Costa Rica	Diversification	0,915	0,948	0,819	0,033	Peru	Diversification	0,914	0,930	0,891	0,010
	Adjusted HH	0,081	0,177	0,048	0,033		Adjusted HH	0,082	0,105	0,066	0,010
	Total Theil	2,215	2,742	1,942	0,222		Total Theil	2,500	2,651	2,301	0,110
	Theil Within	1,994	2,530	1,730	0,212		Theil Within	2,325	2,497	2,118	0,118
	Theil Between	0,221	0,291	0,191	0,031		Theil Between	0,175	0,212	0,143	0,021
Ecuador	Diversification	0,766	0,848	0,668	0,061	Uruguay	Diversification	0,945	0,955	0,924	0,009
	Adjusted HH	0,230	0,329	0,148	0,061		Adjusted HH	0,051	0,072	0,040	0,009
	Total Theil	3,381	3,819	3,091	0,227		Total Theil	2,014	2,148	1,882	0,092
	Theil Within	3,067	3,388	2,801	0,199		Theil Within	1,734	1,897	1,586	0,113
	Theil Between	0,313	0,805	0,195	0,147		Theil Between	0,280	0,319	0,238	0,030
El Salvador	Diversification	0,828	0,938	0,632	0,123	Venezuela	Diversification	0,573	0,907	0,160	0,161
	Adjusted HH	0,169	0,365	0,058	0,123		Adjusted HH	0,425	0,839	0,089	0,161
	Total Theil	2,586	3,424	1,983	0,554		Total Theil	4,074	5,123	2,685	0,523
	Theil Within	2,356	3,212	1,732	0,567		Theil Within	3,882	4,911	2,408	0,516
	Theil Between	0,230	0,273	0,187	0,025		Theil Between	0,192	0,314	0,159	0,043
Guatemala	Diversification	0,941	0,968	0,892	0,022	LAC	Diversification	0,875	0,980	0,160	0,114
	Adjusted HH	0,055	0,104	0,028	0,022		Adjusted HH	0,121	0,839	0,016	0,114
	Total Theil	1,957	2,394	1,632	0,235		Total Theil	2,495	5,123	1,209	0,745
	Theil Within	1,772	2,147	1,485	0,207		Theil Within	2,237	4,911	1,055	0,694
	Theil Between	0,186	0,264	0,147	0,036		Theil Between	0,258	1,055	0,123	0,161

Table 4. Active Lines at three-digit SITC.

<b>COUNTRY</b>	<b>MEAN OF ACTIVE LINES</b>	<b>MIN</b>	<b>MAX</b>	<b>SD</b>
<b>Argentina</b>	254	251	256	1,47
<b>Bolivia</b>	197	151	231	25,10
<b>Brazil</b>	254	248	258	2,92
<b>Chile</b>	250	243	254	2,68
<b>Colombia</b>	248	239	256	5,25
<b>Costa Rica</b>	235	219	242	7,05
<b>Ecuador</b>	216	131	241	26,88
<b>El Salvador</b>	233	223	243	5,81
<b>Guatemala</b>	244	225	253	8,75
<b>Mexico</b>	256	251	259	2,00
<b>Nicaragua</b>	213	196	229	10,31
<b>Panama</b>	176	118	241	49,98
<b>Paraguay</b>	170	102	208	29,90
<b>Peru</b>	246	237	254	5,05
<b>Uruguay</b>	222	213	231	6,69
<b>Venezuela</b>	242	214	250	10,07
<b>LAC</b>	229	102	259	31,82

Source: Author's calculation using UN Comtrade, SITC rev 3 at 3-digits

Table 5. Statistics of the number of Markets.

COUNTRY	MEAN	MIN	MAX	SD	MEDIAN
Argentina	163	136	184	16	160
Bolivia	89	68	116	15	85
Brazil	194	165	215	18	202
Chile	152	119	179	18	154
Colombia	159	139	182	15	159
Costa Rica	126	111	148	13	122
Ecuador	124	83	153	22	127
El Salvador	89	62	118	19	88
Guatemala	112	89	143	15	108
Mexico	175	141	204	21	175
Nicaragua	80	54	109	18	75
Panama	82	61	125	23	70
Paraguay	91	59	124	23	84
Peru	148	107	173	20	144
Uruguay	133	96	171	23	123
Venezuela	111	92	133	12	109
LAC	129	54	215	39	125

Table 6. Margins of the export growth rate (right side is the separation and left side is as percent)

Country	Variable	Mean	Max	Min	SD	Country	Variable	Mean	Max	Min	Intensive Margin	Extensive Margin
Argentina	Export Growth Rate	24,0%	36,2%	5,3%	16,5%	Argentina	Persisting	98,33	100,07	76,69	98,30	2,55
	Persisting	23,6%	36,2%	4,0%	17,2%		New	2,55	23,33	0,00		
	New	0,6%	1,2%	0,0%	0,9%		disappearing	-0,03	0,00	-0,07		
	disappearing	0,0%	0,0%	0,0%	0,0%							
Bolivia	Export Growth Rate	53,2%	86,9%	27,5%	30,5%	Bolivia	Persisting	96,43	106,03	69,73	94,67	5,33
	Persisting	51,3%	86,8%	19,2%	33,9%		New	5,33	30,49	0,01		
	New	2,8%	8,4%	0,0%	4,8%		disappearing	-1,76	-0,02	-6,04		
	disappearing	0,9%	2,7%	0,0%	1,6%							
Brazil	Export Growth Rate	40,3%	83,8%	9,8%	31,5%	Brazil	Persisting	99,36	99,57	98,83	99,36	0,64
	Persisting	40,1%	83,2%	9,7%	31,3%		New	0,64	1,17	0,43		
	New	0,3%	0,5%	0,1%	0,2%		disappearing	0,00	0,00	0,00		
	disappearing	0,0%	0,0%	0,0%	0,0%							
Chile	Export Growth Rate	46,9%	98,9%	7,4%	44,5%	Chile	Persisting	101,58	139,67	99,97	99,99	0,03
	Persisting	47,7%	99,0%	10,3%	43,6%		New	0,03	0,03	0,01		
	New	0,0%	0,0%	0,0%	0,0%		disappearing	-1,59	0,00	-39,67		
	disappearing	0,7%	2,9%	0,0%	1,5%							
Colombia	Export Growth Rate	38,1%	55,7%	17,6%	16,4%	Colombia	Persisting	99,92	100,00	99,80	99,92	0,08
	Persisting	38,1%	55,6%	17,6%	16,4%		New	0,08	0,21	0,00		
	New	0,0%	0,1%	0,0%	0,0%		disappearing	0,00	0,00	0,00		
	disappearing	0,0%	0,0%	0,0%	0,0%							
Costa Rica	Export Growth Rate	45,3%	87,8%	11,2%	39,0%	Costa Rica	Persisting	99,70	99,99	99,65	99,69	0,31
	Persisting	45,2%	87,5%	11,2%	38,8%		New	0,31	0,35	0,01		
	New	0,1%	0,3%	0,0%	0,2%		disappearing	0,00	0,00	-0,01		
	disappearing	0,0%	0,0%	0,0%	0,0%							
Ecuador	Export Growth Rate	38,5%	91,9%	-6,2%	41,4%	Ecuador	Persisting	98,74	100,03	-99,92	98,72	1,28
	Persisting	38,0%	91,9%	-6,2%	41,3%		New	1,28	4,22	0,00		
	New	0,5%	1,9%	0,0%	1,0%		disappearing	-0,02	0,00	-0,15		
	disappearing	0,0%	0,0%	0,0%	0,0%							
Guatemala	Export Growth Rate	63,1%	173,2%	7,6%	95,4%	Guatemala	Persisting	99,78	99,92	97,89	99,33	0,67
	Persisting	62,9%	173,0%	7,6%	95,3%		New	0,67	2,22	0,10		
	New	0,4%	1,1%	0,0%	0,6%		disappearing	-0,45	-0,02	-0,49		
	disappearing	0,3%	0,8%	0,0%	0,5%							
Mexico	Export Growth Rate	68,7%	180,8%	6,5%	78,7%	Mexico	Persisting	100,01	100,21	99,98	99,97	0,03
	Persisting	68,7%	180,7%	6,5%	78,7%		New	0,03	0,02	0,00		
	New	0,0%	0,0%	0,0%	0,0%		disappearing	-0,04	-0,06	-0,21		
	disappearing	0,0%	0,0%	0,0%	0,0%							
Nicaragua	Export Growth Rate	51,7%	117,3%	-9,3%	63,4%	Nicaragua	Persisting	99,91	100,00	-100,51	99,87	0,13
	Persisting	51,6%	117,2%	-9,3%	63,4%		New	0,13	0,91	0,06		
	New	0,1%	0,1%	0,0%	0,0%		disappearing	-0,04	0,00	-0,40		
	disappearing	0,0%	0,0%	0,0%	0,0%							
Panama	Export Growth Rate	19,5%	29,0%	7,6%	10,9%	Panama	Persisting	100,82	101,85	99,89	99,74	0,26
	Persisting	19,7%	29,3%	7,7%	11,0%		New	0,26	0,84	0,11		
	New	0,0%	0,1%	0,0%	0,0%		disappearing	-1,07	0,00	-2,69		
	disappearing	0,2%	0,4%	0,0%	0,2%							
Paraguay	Export Growth Rate	42,1%	119,4%	-20,7%	59,3%	Paraguay	Persisting	96,79	99,88	-107,62	96,52	3,48
	Persisting	40,8%	119,3%	-22,3%	60,1%		New	3,48	13,67	0,13		
	New	1,5%	2,6%	0,2%	1,0%		disappearing	-0,27	-0,02	-1,46		
	disappearing	0,1%	0,3%	0,0%	0,1%							
Peru	Export Growth Rate	56,7%	126,6%	12,0%	61,3%	Peru	Persisting	99,99	100,00	99,98	99,99	0,01
	Persisting	56,7%	126,6%	12,0%	61,3%		New	0,01	0,02	0,00		
	New	0,0%	0,0%	0,0%	0,0%		disappearing	0,00	0,00	0,00		
	disappearing	0,0%	0,0%	0,0%	0,0%							
Venezuela	Export Growth Rate	37,6%	97,9%	4,6%	41,3%	Venezuela	Persisting	100,03	102,77	99,89	99,92	0,08
	Persisting	37,6%	97,8%	4,8%	41,3%		New	0,08	0,12	0,00		
	New	0,0%	0,1%	0,0%	0,1%		disappearing	-0,11	-0,01	-2,77		
	disappearing	0,0%	0,1%	0,0%	0,1%							
LAC	Export Growth Rate	47,2%	180,8%	-20,7%	46,0%	LAC	Persisting	98,93	139,67	-107,62	98,55	1,58
	Persisting	46,7%	180,7%	-22,3%	45,7%		New	1,58	30,49	0,00		
	New	0,7%	14,0%	0,0%	2,4%		disappearing	-0,39	0,00	-39,67		
	disappearing	0,2%	2,9%	0,0%	0,6%							

Figure 1. Total Exports. Selected years.

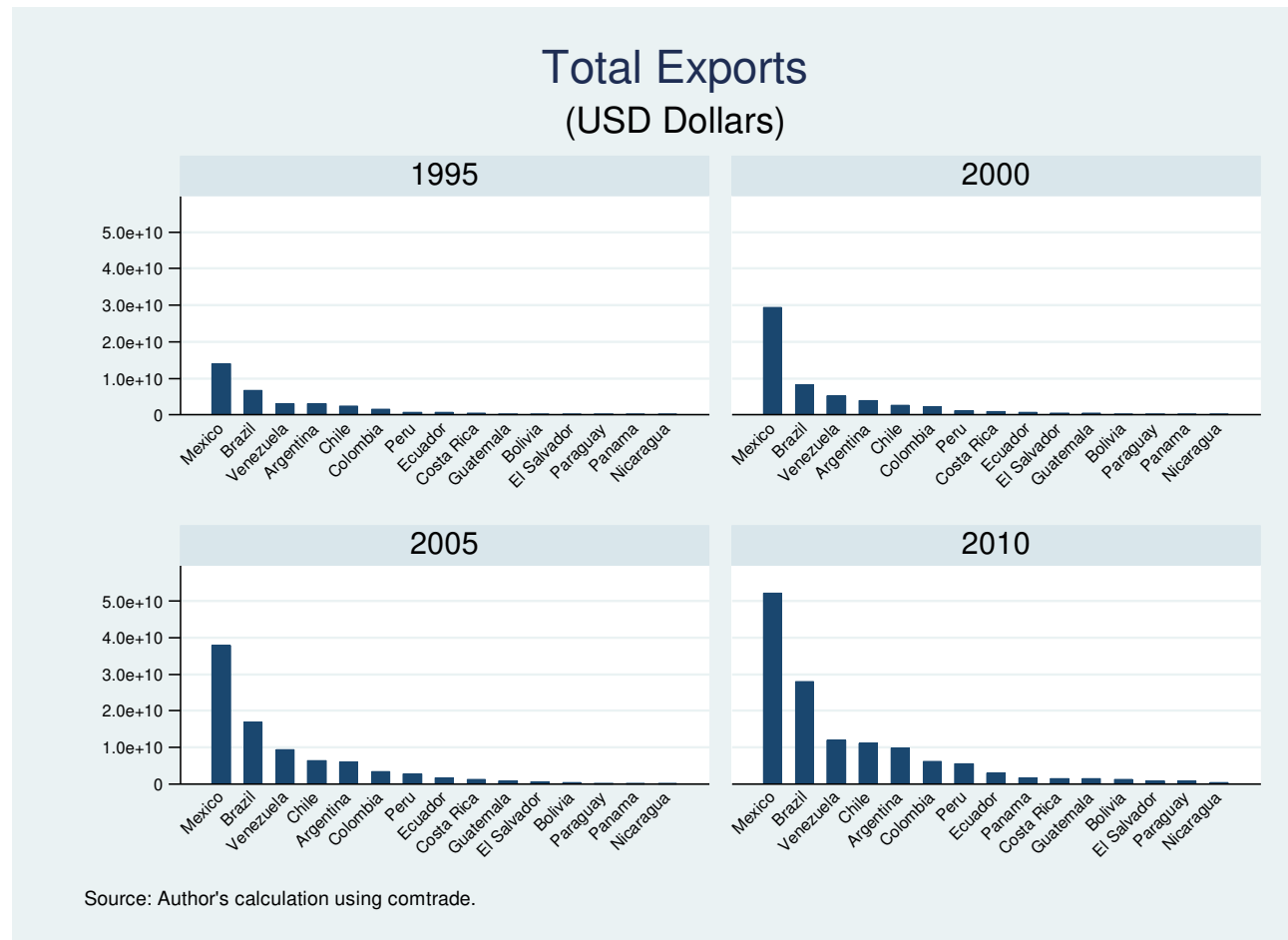


Figure 2. Latin America Export Growth Rate in percent. (Average from those selected countries in LAC)

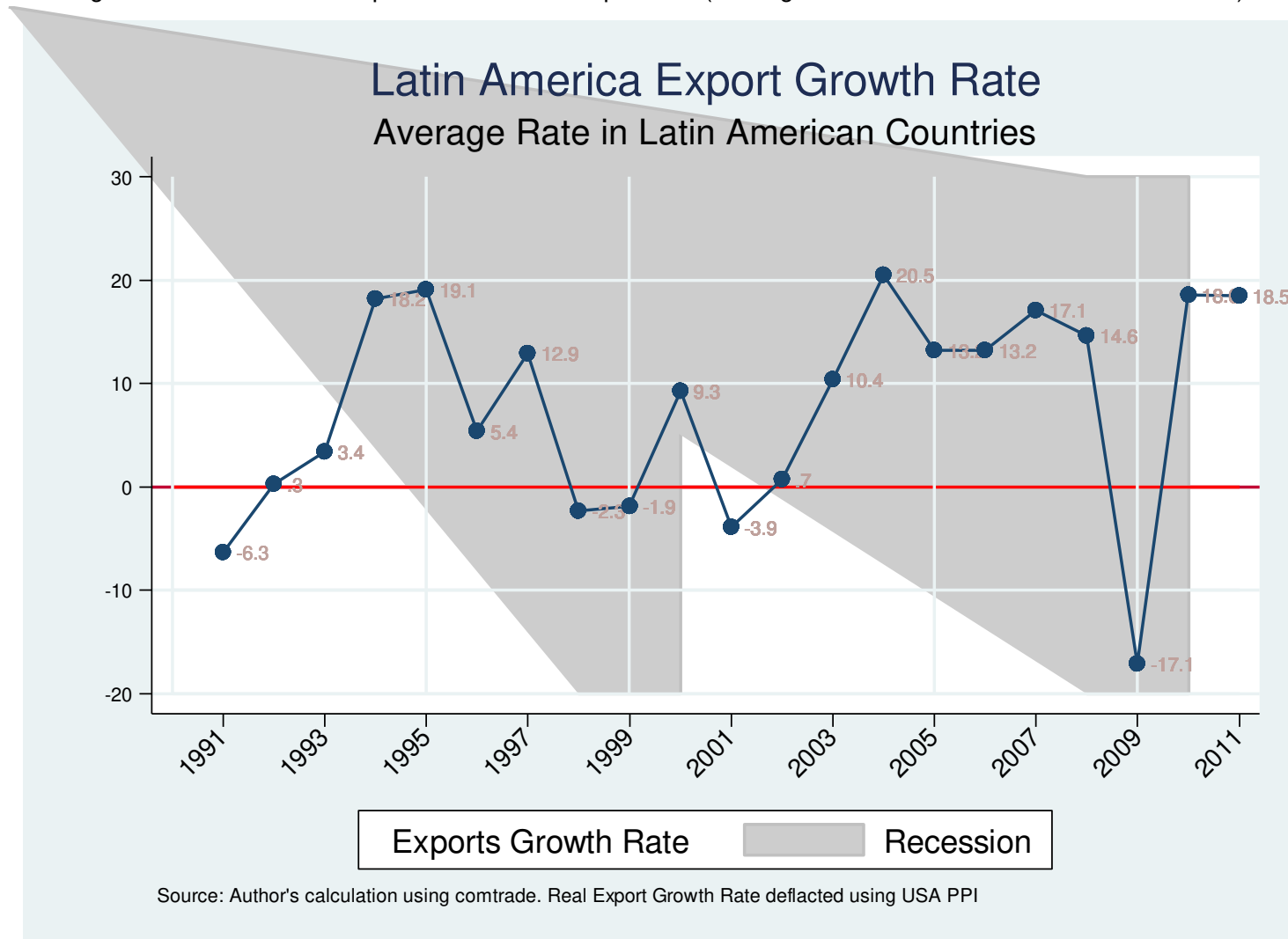


Figure 3. Export Growth Rate (%). Selected countries in Latin America

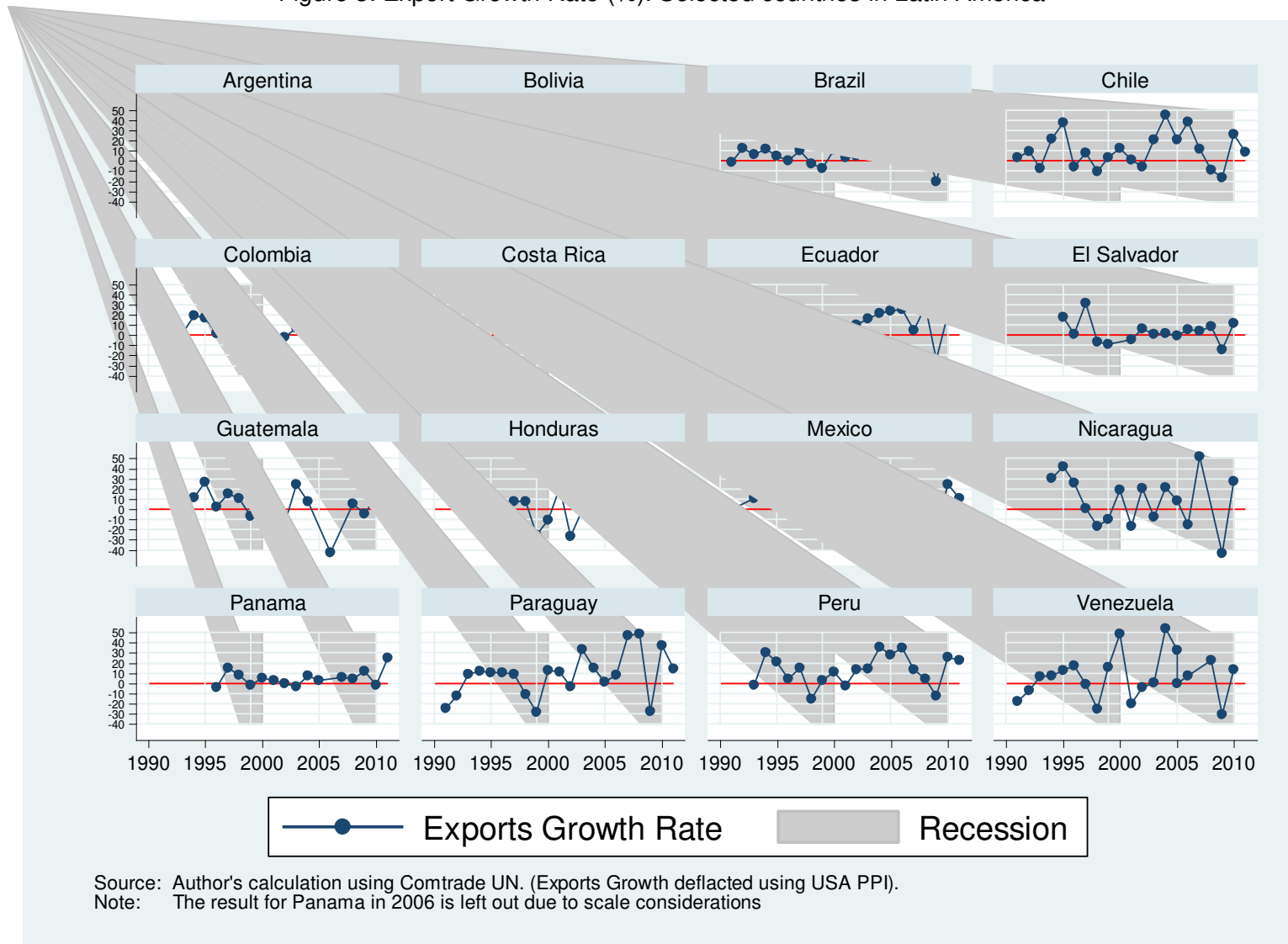
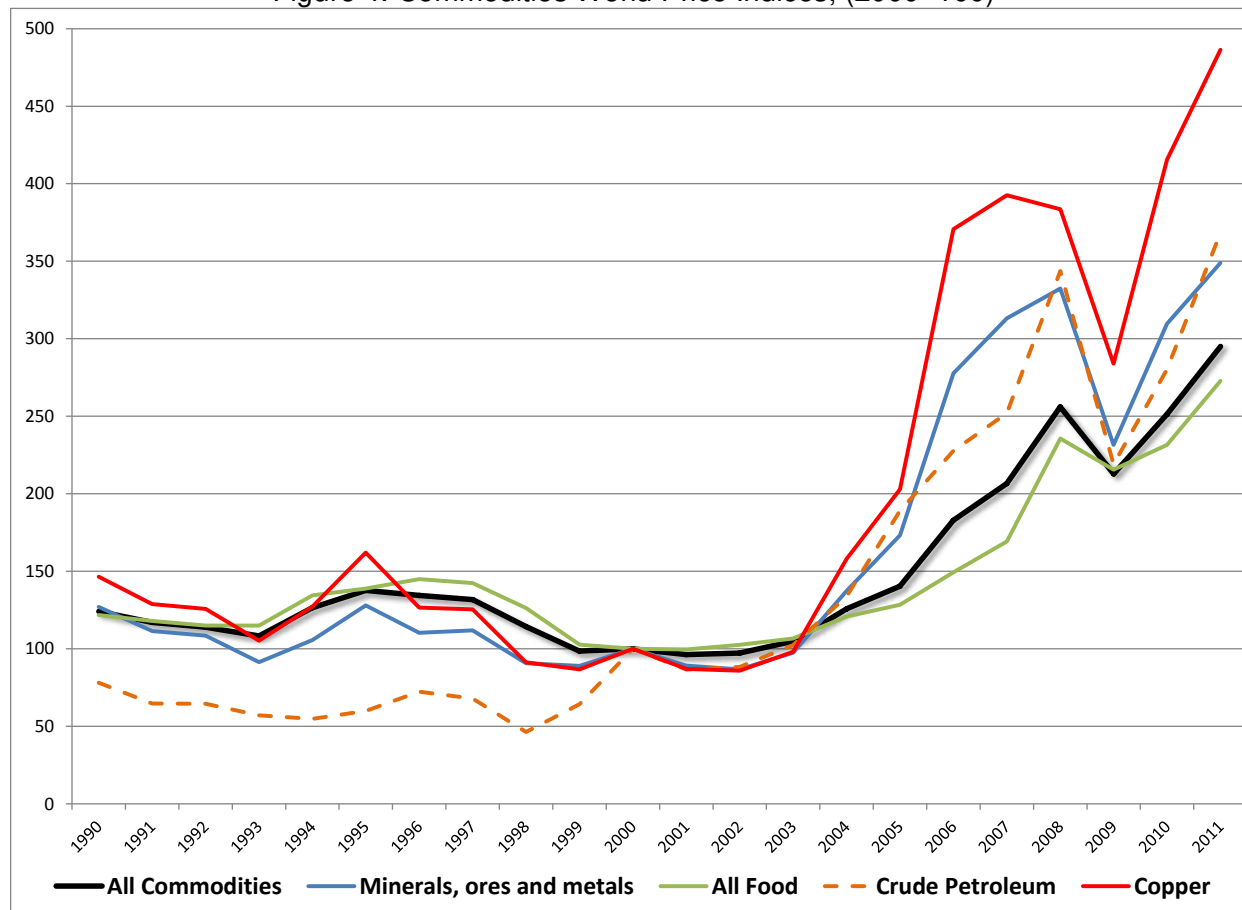




Figure 4. Commodities World Price Indices, (2000=100)



Source: Author's calculation using UNCTAD database.

Figure 5. Terms of Trade.



Figure 6. Export Diversification using HH.

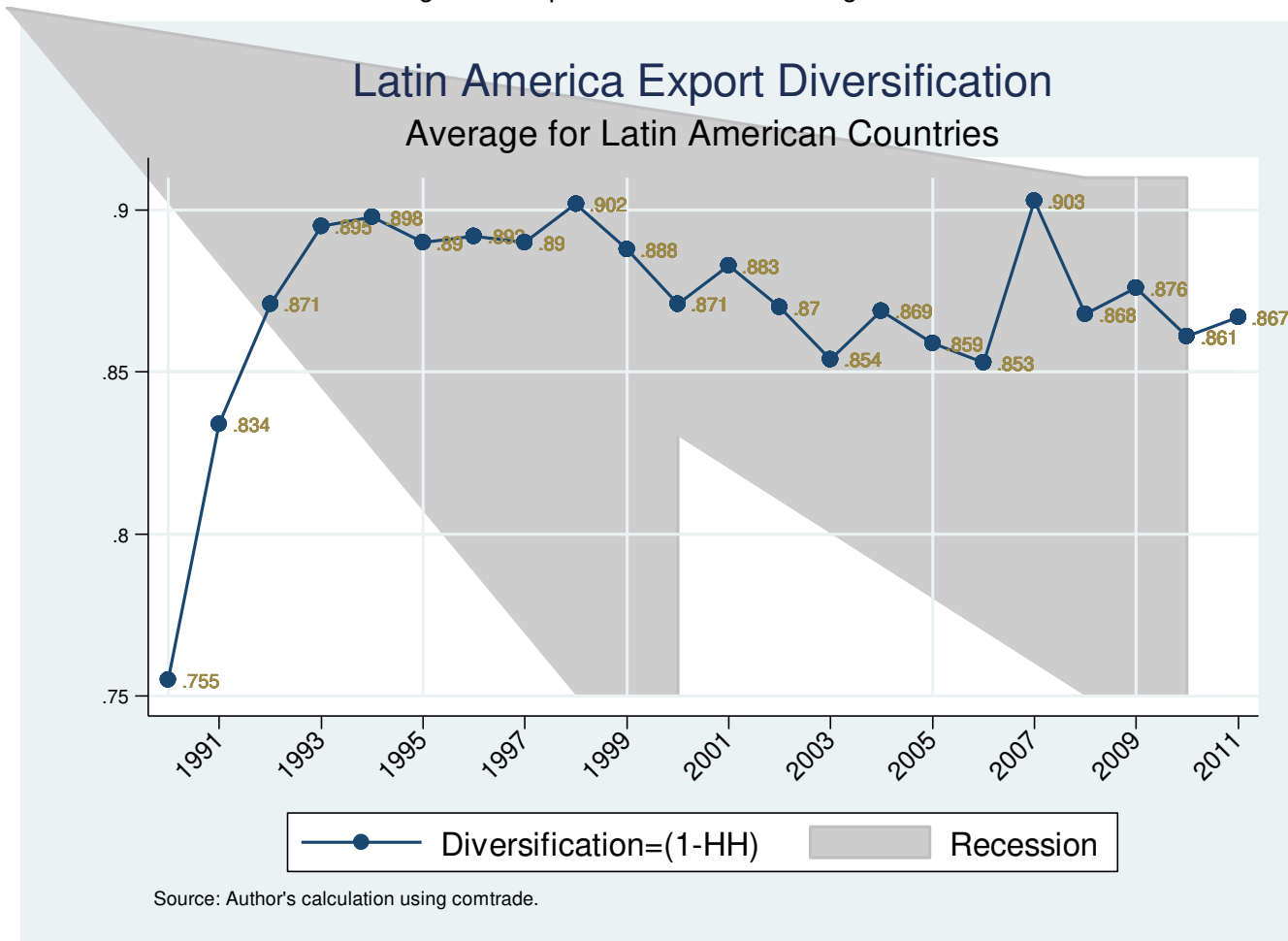


Figure 7. Export Diversification using HHI.

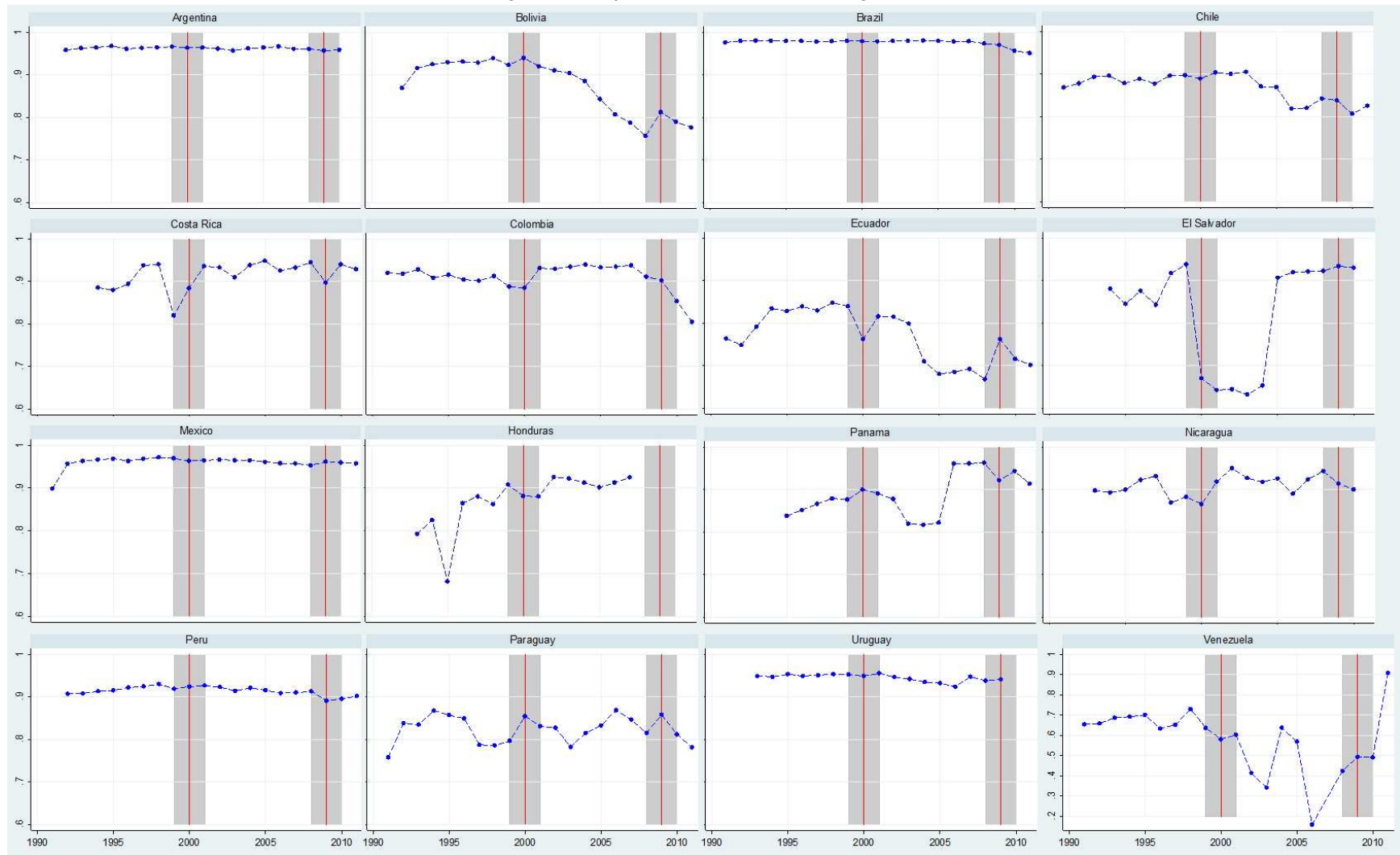
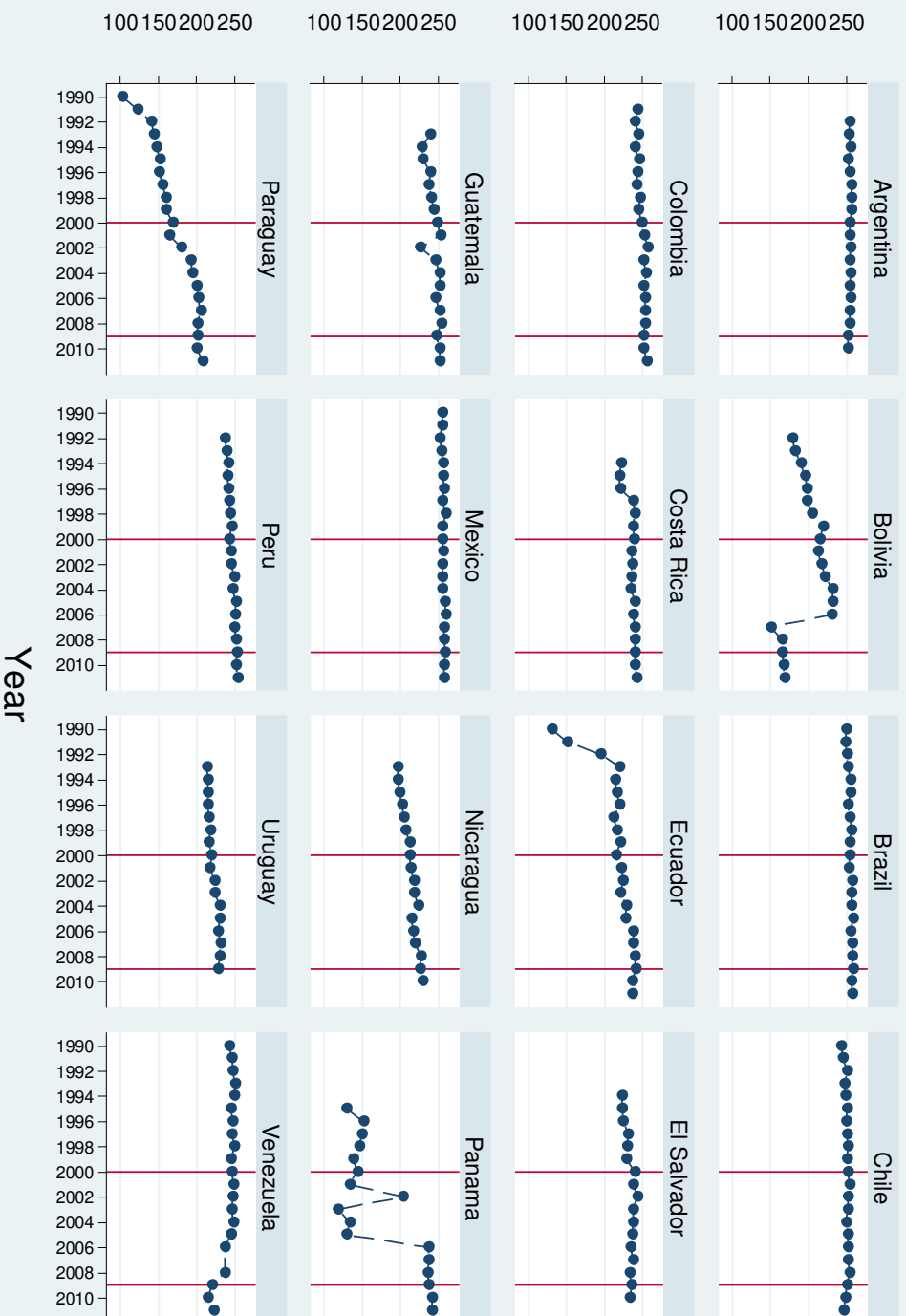


Figure 8. Number of Active Lines at three-digit



Source: Author's calculation using UN Comtrade, SITC rev 3

Figure 9. Share of Exports by Commodities (a).



Figure 10. Share of Exports by Commodities (b).

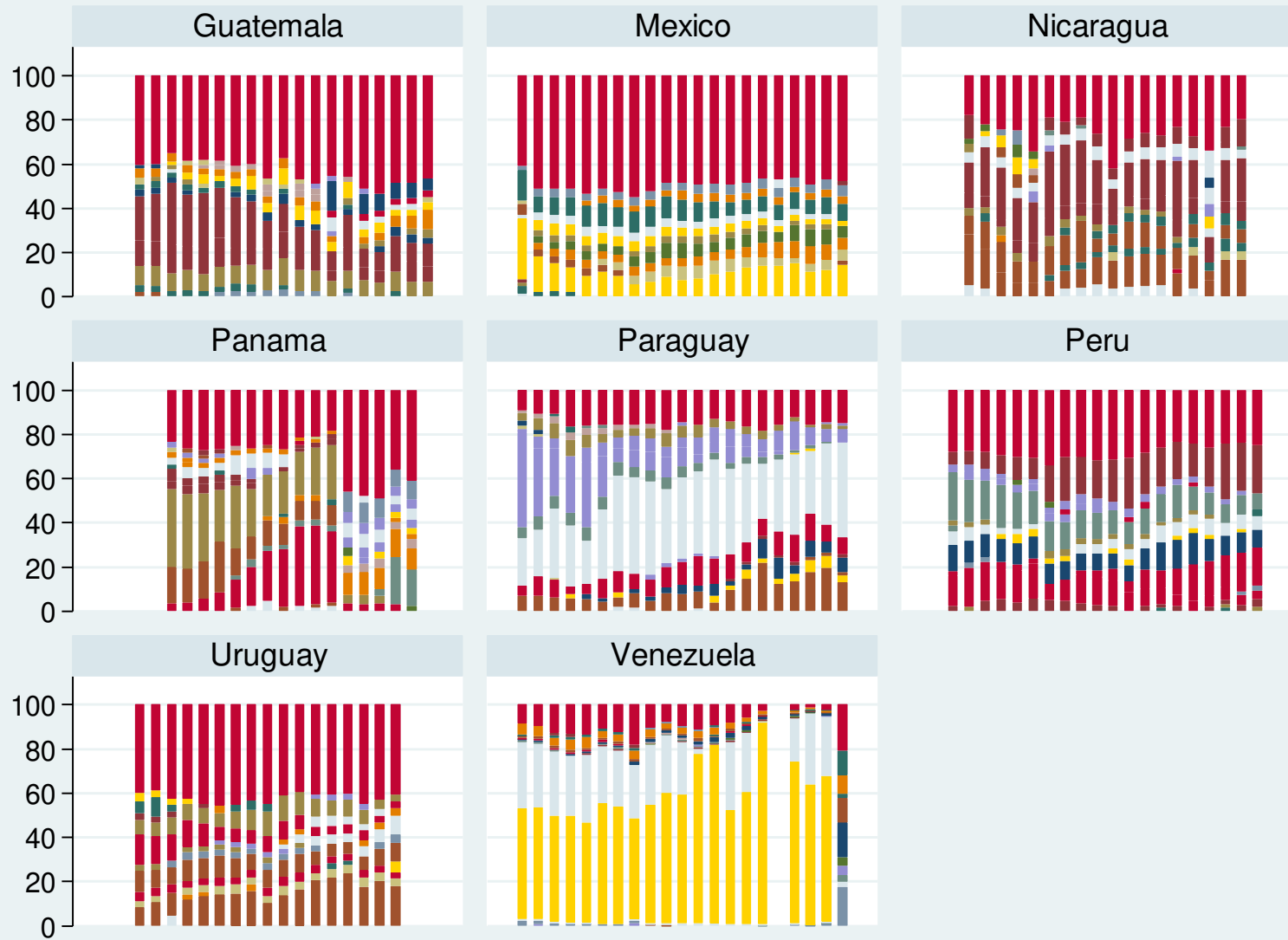
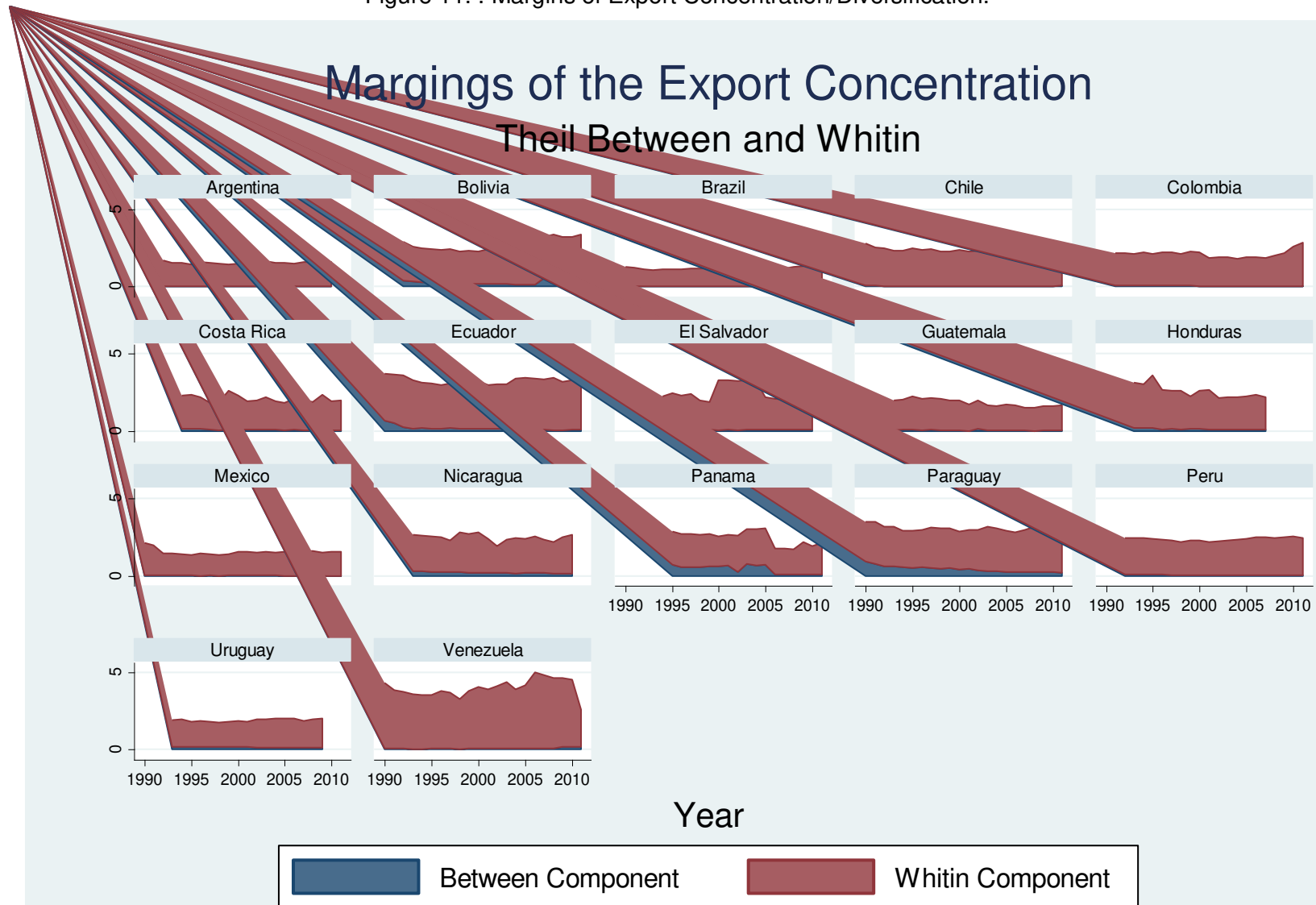


Figure 11. . Margins of Export Concentration/Diversification.



Source: Author's calculation using UN Comtrade.



Figure 12. Number of Markets.

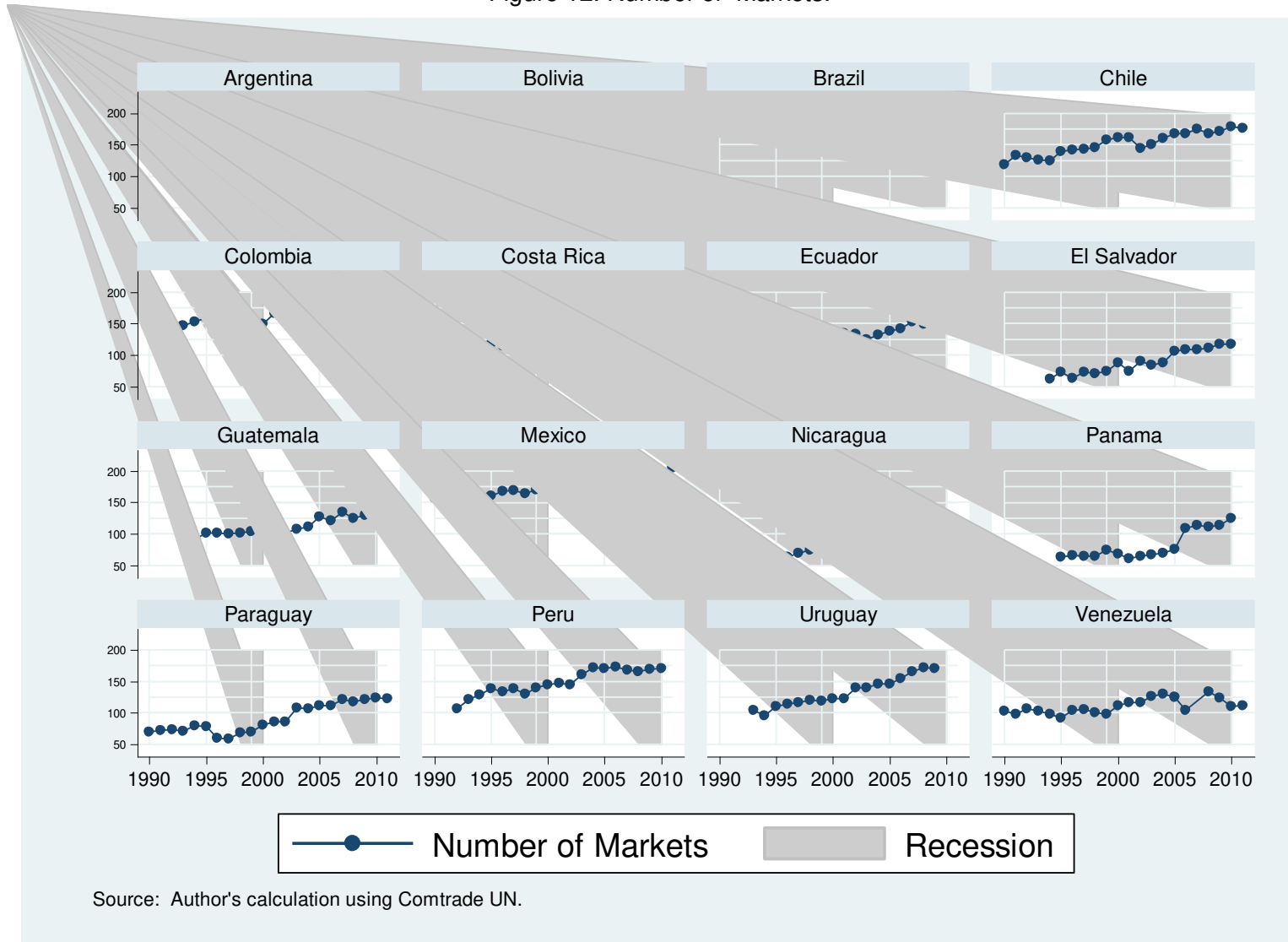


Figure 13. Destinations of Exports (a)

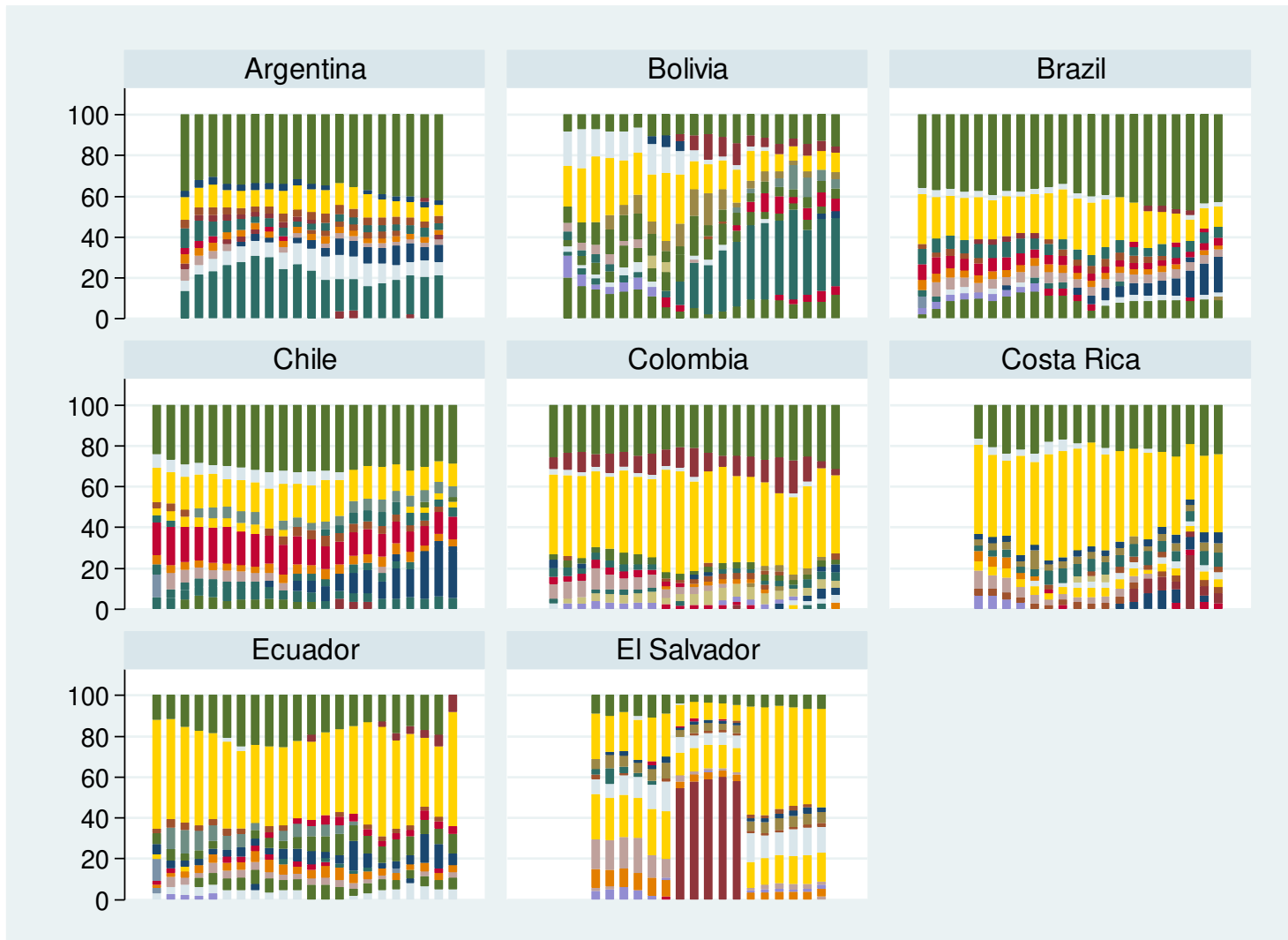


Figure 14. Destinations of Exports (b)

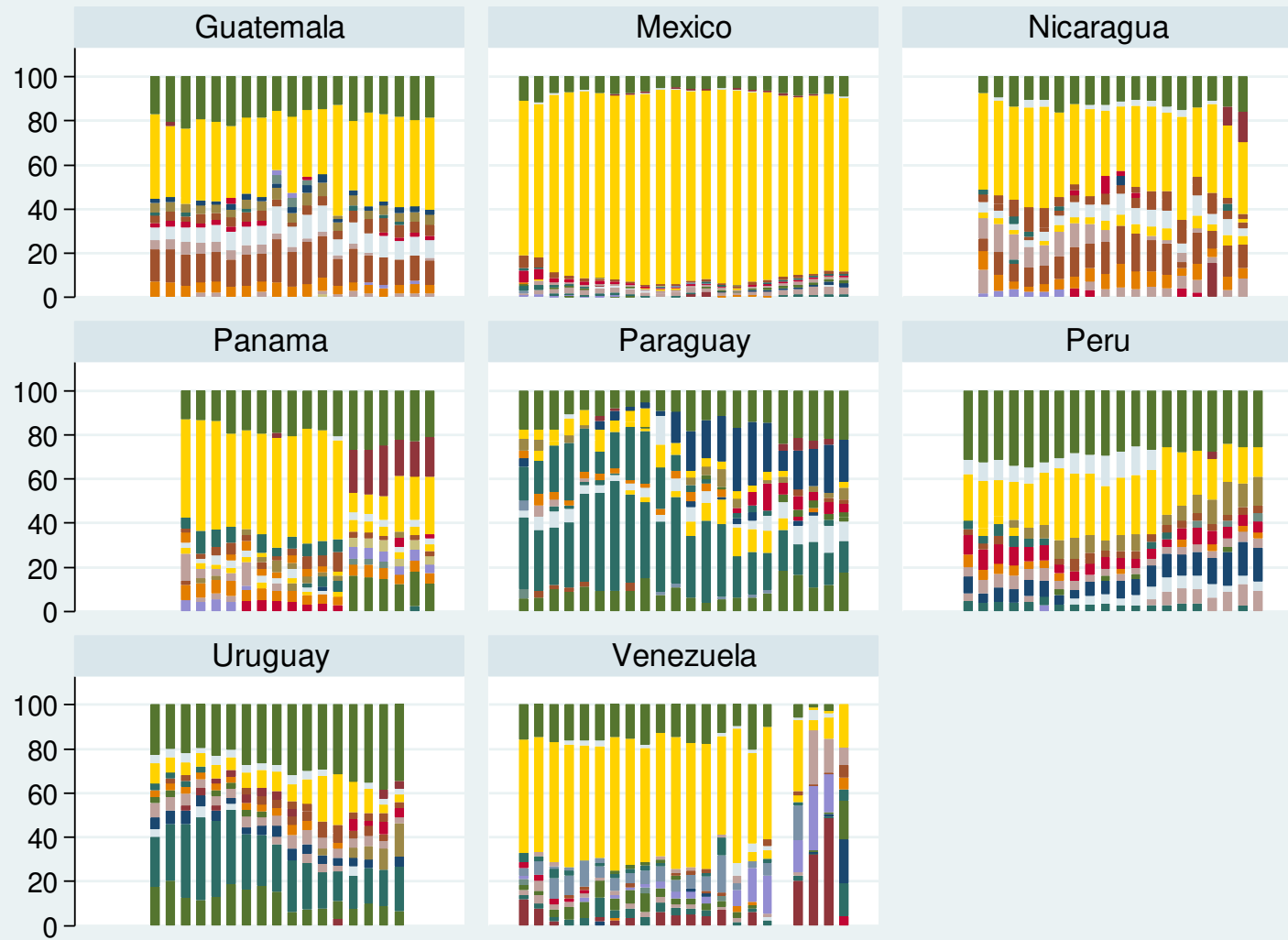
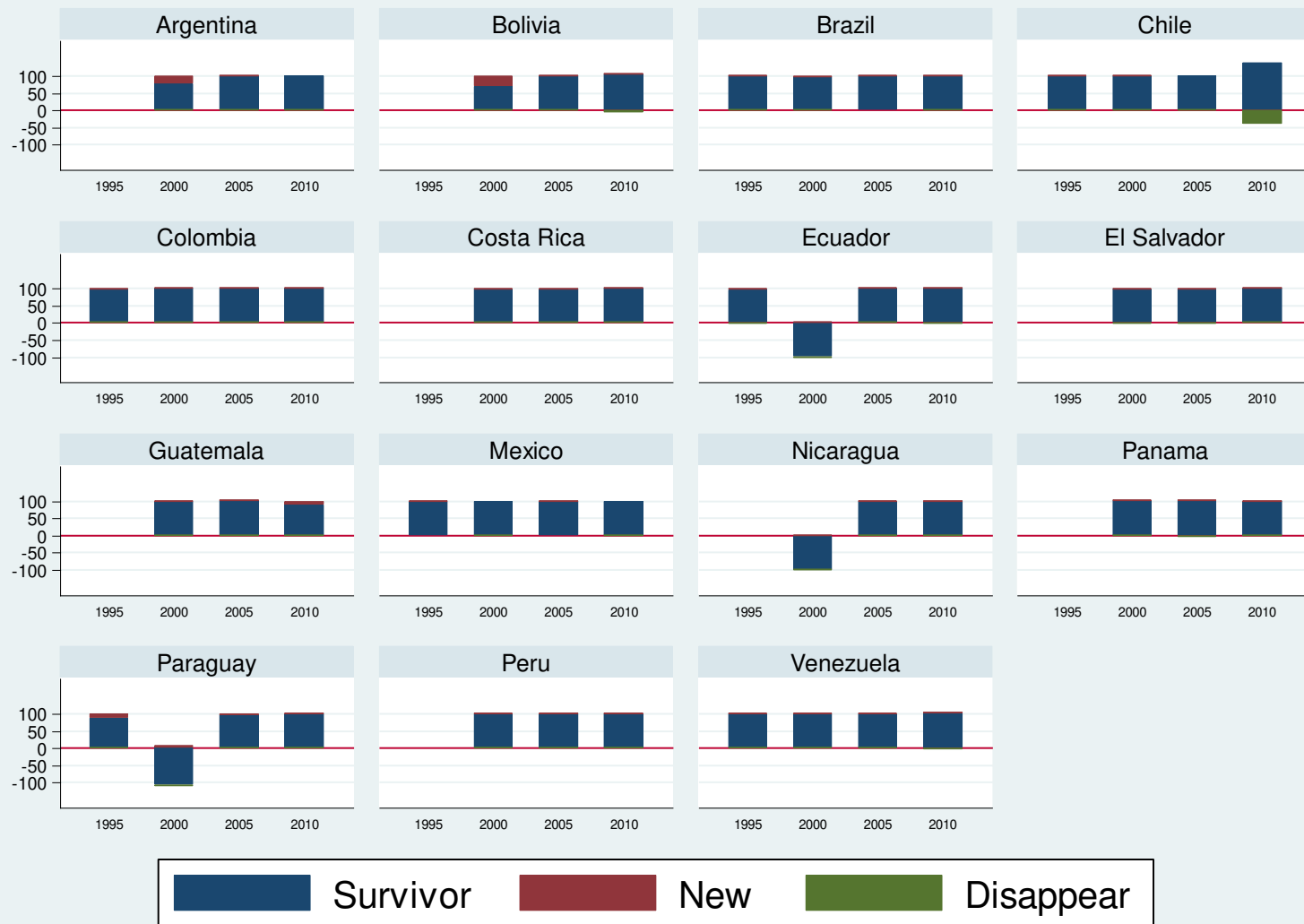


Figure 15. Margins of the Export Growth Rate.



Source: Athor's calculation using UN Comtrade database.

## Export Diversification Indexes

The measures of diversification/concentration are based on measures of income distribution and industrial concentration indexes. Diversification index can be defined as one minus Hirschman-Herfindahl's (HH), considering that it goes into zero and one  $[0, 1]^4$ , ( $DIV=1-HH$ ). Others analogous measures are the Adjusted Hirschman-Herfindahl's index and Theil index. For more details about concentration/diversification indexes see Cadot et al (2011) and Samen (2010).

$$HH_{c,t} = \sum_i^{n_{c,t}} \left( \frac{x_{i,c,t}}{x_{c,t}} \right)^2$$

$$HH_{c,t}^{adj} = \frac{HH_{c,t} - 1/n_{c,t}}{1 - 1/n_{c,t}}$$

$$Theil = \frac{1}{n_{c,t}} \sum_i^{n_{c,t}} \frac{x_{i,c,t}}{\mu_{c,t}} \ln \left( \frac{x_{i,c,t}}{\mu_{c,t}} \right)$$

$$\text{With, } \mu_{c,t} = \frac{1}{n_{c,t}} \sum_i^{n_{c,t}} x_{i,c,t}$$

Where  $x_{i,c,t}$  represents the export value of product  $i$  by country  $c$  in period  $t$ , computed using industry exports at different digit SITC.  $\mu_{c,t}$ ,  $x_{c,t}$  and  $n_{c,t}$  are the average of export values, total value of exports and total number of active lines, respectively.

---

<sup>4</sup> If  $HH \rightarrow 1$ , means high concentration or less diversification.